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Introduction [redacted]

(U) As described in Chapter One, the basic mission of the 6594th Test Group was to "develop and maintain the capability to effect the aerial and surface recovery of a capsule ejected from an orbiting satellite." This was their primary mission; it was the reason for the activation -- and eventually, deactivation -- of the Group.* Specially modified C-130 aircraft were used for aerial recoveries while surface recovery was conducted with HH-53 helicopters.**

Aircraft [redacted]

[redacted] For the bulk of their missions, the Test Group launched 19 aircraft. Ten JC-130 aircraft supported aerial recovery operations while nine aircraft supported surface recovery operations -- three C-130P tankers and six HH-53C helicopters. The ten JC-130s included seven JC-130Bs and three were JC-130Hs -- the H-models were somewhat newer and boasted large, external fuel tanks for extended range.[1]

[redacted] Three major modifications converted a C-130 to a JC-130 -- installation of telemetry equipment, a winch and the aerial recovery set. Just aft of the aircraft flight deck, there were two electronic equipment racks. At those two positions, an electronic direction finding (EDF) operator and a telemetry

recording operator performed their functions. The EDF operator took electronic bearings on the descending capsule's two UHF beacons and provided a bearing to the pilot. The telemetry operator recorded the signals for later analysis.[2]

[redacted] Aft of the TM and EDF positions were the console and winch that were the heart of the aerial recovery system. The recovery cable was wrapped on the winch drum inside a special cover and it rolled off the winch through the recovery dolly, much like a fishing reel. From his console position, the winch operator could control the reel-in of the capsule.* The recovery cable then passed from the winch, through the cargo compartment, through a protective shield in front of the dolly and finally back through the dolly boom. There, it attached to the recovery loop which extended below the aircraft. Located on the loop were hardened-steel hooks that engaged the parachute load-bearing lines and brought the capsule up to aircraft speed.[3]

[redacted] If the aerial recovery was not successful or could not be accomplished for any reason, the primary surface forces took over. They consisted of six HH-53C helicopters and three C-130 escort tankers. The helicopters were similar to those used by the Air Force's Aerospce Rescue and Recovery Service and they had the typical rescue gear, large external auxiliary fuel tanks, aerial refuleing system for extended range and the rescue hoist mounted by the crew entrance on the right side of the aircraft.[4]

[redacted] Additionally, the aircraft had been futher modified for spacecraft recovery operations. To allow percise open-ocean navigation, the helicopters had an inertial naviation system -- the Delco Carousel IV -- similar to that used on most Boeing 747 aircraft. Due to the potential length of the recovery missions, a crew comfort area was placed aft of the pilot's compartment. It consisted of three airline-type seats and a small galley. Aft of the crew comfort area, a large auxiliary fuel tank was installed for extended range. Finally, at the rear of the helicopter, there was the surface recovry set mounted on the floor and could be moved fore or aft in the helicopter cabin. It consisted of a winch mounted on a plate on the floor which fed a line through the crane. At the end of the line was a hook. The hook was lowered below the helicopter to the pararescue specialists in the water who would attach the capsule to it. The capsule was then raised, settled into the cradle and then brought forward into the aircaft.[5]

[redacted] As mentioned above, the Test Group's C-130P tankers were rescue-type aircraft with no special modification for recovery operations. Nevertheless, they were critical to the Test Group's mission. The size of the recovery area -- or ballpark -- was determined by the range of the helicopters. Without aerial refueling, they were limited to 300 nautical miles measured from the predicted impact point (PIP) to a suitable landing base. With the tankers and aerial refueling,

that range was extended to 675 nautical miles. (The larger radius represented the unrefueled return range from the PIP to the landing base. A mission range of 675 NM was based on three planned aerial refuelings outbound.)[6]

Recovery Control Center [redacted]

[redacted] All recovery operations were directed from the Test Group's Recovery Control Center, located in Hanger 2 at Hickam AFB. From the center console, the recovery task force commander -- normally the Test Group commander -- could monitor mission information and recovery event displays via a closed circuit television system and projections onto large screens in the front of the RCC. Assisting the commander was the mission coordinator who was the action officer on all preliminary planning. Approximately 45 minutes prior to the recovery, the mission coordinator would establish a hot-line to Sunnyvale and pass progress information to them. The Force Controller, meanwhile, maintained high-frequency radio contact with the on-scene aerial and surface recovery aircraft. The Assistant Force Controller coordinated airspace reservations with the Federal Aviation Agency and maintained communications with the tracking station at Kaena Point.[7]

[redacted]

[redacted] The Recovery Control Center was supported by dedicated communications network monitored through the radio room, which was located directly behind the RCC and operated 24 hours a day. The radio operators managed the radio systems used by the force controller and updated the information that was displayed on the closed circuit television system. Direct contact was maintainted with the Air Force Satellite Control Facility in Sunnyvale through two systems -- first, a dedicated telephone line; and second, with a dedicated, secure teletype circuit from the communications center at Sunnyvale to the communications center at the Test Group. There were also two systems to maintain communications with the airborne recovery forces -- a local ultra-high-frequency and high-frequency capability with limited range as well as the primary communications network with high frequency receivers and transmitters located at Wahiawa Naval Communications Station and at Bellow AFS on Oahu.[8]

External Support [redacted]

[redacted] Although remarkably self-sufficient, the Test Group worked with several other agencies. One of the most important was the Federal Aviation Administration, which provided airspace reservations. During recovery operations, the Group's crews required a large block of airspace to provide maneuvering room

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[redacted]

for the JC-130s -- a block that would possibly cover the entire Hawaiian Island chain and have a serious impact on civilian air traffic coming to and from the Hawaiian islands. As a result, the Group worked closely with the FAA to minimize the impact on civilian flights while still meeting mission requirements. Furthermore, since Hickam AFB shared runways with Honolulu International Airport, the Group worked closely with them during flying operations.[9]

[redacted] The Group also worked closely with several Navy organizations. The Fleet Training Group and Pacific Missile Range Facility managed vast ocean areas for military training and testing in the Hawaiian islands. When necessary, the Test Group could preempt the training areas; however, they worked closely with the Navy to minimize the impact on their operation. The Naval Western Oceanography Center, meanwhile, provided twice-daily sea status reports for the intended recovery area. This information was vital in the event that surface recovery became necessary. Finally, the Navy also provided a secondary surface recovery capability. In the event the Group's helicopters could not support a recovery attempt -- i.e. the ballpark was too large as the result of a spacecraft malfunction -- the Navy provided surface vessels to cover the intended recovery area and assist in surface recovery operations.[10]

[redacted]

[redacted] The Group received significant assistance from several organizations at Hickam AFB. The host unit, the 15th Air Base Wing, provided normal base-level support as well as intermediate aircraft maintenance support. (The 15th ABW provided more than 200 positions dedicated to Test Group support in avionics, sheet metal and jet engine repair.) The 1957th Communications Group maintained the Group's remote radio equipment at Wahiawa and Bellows as well as the cryptographic gear in the Test Group's communications center. The Defense Meteorlogical Satellite Program (DMSP) to provided satellite photos for the Group's weather forecasts. Detachment 3 of the 1363rd Audiovisual Squadron provided photographers and equipment for documenting mission recoveries and recording training recoveries.* Finally, Detachment 4 of the 20th Weather Wing provided personnel and equipment for weather observation and analysis.[11]

[redacted] Since the recoveries were strictly visual maneuvers, the Group relied heavily on accurate weather forecasts. Assisting the forecaster were two types of weather satellites -- polar orbit and geostationary. The polar orbit spacecaft included the DMSP as well as National Oceanographic and Atmospheric Agency spacecraft, NOAA 6 and NOAA 7. They made 14 revolutions of the earth each day at an average altitude of 445 nautical miles. The geostationary soruces were GOES east and west as well as the Japanese meteorlogical satellite. These

[redacted] [redacted]

spacecraft maintained a stationary position 22,000 miles above the earth and rotated with it, providing a constant image of the same area. Det 4 also provided an observer for the weather reconnaisance aircraft which flew into the intended recovery area to recommend a Go or No-Go decision or change of location.[12]

[redacted] With the exception of the communications sites discussed above, all Test Group facilities were located at Hickam AFB. They included Hanger 2, which housed the RCC as well the the commander and staff offices. Additionally, most of the operations division personnel were also located in Hanger 2. The pararescue forces had their office areas and equipment storage in Hanger 7. The logistics division and recovery systems branch were located in hangers 11 and 13. The Group also had a nose dock building on the flight line for C-130 maintenance. They also had a dedicated parking location for their aircraft, which was enclosed in a restricted area as the Group's aircraft were considered priority "B" resources. The Test Group was not the only flying organization at Hickam AFB and there were a large number of other aircraft on base; however, it was the largest flying unit.[13]

<u>Typical Mission</u> [redacted]

[redacted] A typical Test Group operation began with the launch of a spacecraft [redacted] from

[redacted]

Vandenberg AFB, California (Vandenberg was used to place spacecraft into polar orbits). The spacecraft mission and recovery activities were normally planned well in advance -- i.e. recoveries scheduled on day 3, 5, 7 and 14. Nevertheless, the Test Group was responsible for providing a recovery capability anytime a designated spacecraft was in orbit. Accordingly, the Group remained ready to perform a recovery throughout the flight of the satellite -- this was commonly called mission mode. The spacecraft normally made 16 revolutions of the earth each day. At least one of those was a daylight pass through the ballpark and it was only during that pass that a recovery could be made. The Group's mission planners monitoried those passes and updated the estimated time of parachute deployment on a daily basis.[14]

[redacted] Prior to commemcement of recovery operations, the assistant force controller requested a large piece of airspace necessary for maneuvering by the aerial recovery forces. It was 480 nautical miles long and 160 nautical miles wide and extended from flight level 220 to flight level 260. Through the box was a "stovepipe" extending from 5,500 feet to uncontrolled airspace. However, the dimensions of the box could vary, depending upon Federal Aviation Agency requirements.[15]

[redacted] Most of the Test Group's resources were involved in a recovery mission. Maintenance personnel worked day and night prior to a recovery mission, preparing aircraft for their

specific mission functions. Well before dawn (normally about 2 a.m.), the uprange telemetry aircraft would leave for its on-station position south of Alaska to record the deorbit telemetry events. Each recovery capsule contained two ultra-high-frequency (UHF) radio beacons which transmitted telemetry data. The uprange telemetry aircraft, as well as the other downrange JC-130s had special telemetry equipment aboard which recorded the signals for later analysis.[16]

[redacted] The weather reconnaisance aircraft was the next to launch and its departute was timed so that it would arrive in the planned recovery area at first light. On board that aircraft were both a recovery aircraft commander and an airborne reconnaisance weather officer who evaluated the weather conditions. Together, they made a recommendation to attempt a recovery in the primary area, move the intended recovery position north or south along the orbital trace or scrub the mission for the day.[17]

[redacted] Several hours later, the JC-130s of the aerial recovery force launched. These aircraft departed to arrive on-scene early enough to form a specific deployment pattern to record electronic bearings on the capsule as it deorbited allowing its position to be precisely fixed before the run-in for aerial recovery. At the estimated time of parachute deployment, each recovery aricraft was in a designated position assure maximum coverage of the entire ballpark. Each recovery aircraft

commander was rated and a strict protocol was followed, assuring the most profficient RAC had first shot at the system. If he could not make the recovery, the other RACs then made the attempt.[18]

[redacted] Depending upon the type of capsule, it would deploy either a Mark 5 or Mark 8 parachute. The Mark 8 system was used for capsules weighing on the order of 1100 pounds. Loadbearing lines extended from the capsule up through the parachute canopy and into a conical extension on top of the parachute. The loadbearing lines were engaged by the recovery hooks to bring the system up to aircraft speed and on board. The distance from the bottom of the capsule to the top of the conical parachure extension was approximately 100 feet -- the cone itself was 15 feet tall. The main parachute canopy was 40 feet in diameter. Since it was too large to fit into the recovery loop, the conical extension was added, and at 12 feet in width, it fit easily into the loop. (By comparision, the C-130 was 98 feet long.) The Mark 5 parachute supported lighter recovery capsules and was also used extensively during the training of RACs. The Mark-5 system was cheaper and easier to handle and repack. After a 4-6 month training program using the Mark-5 system, a RAC in training would enter a transistion phase to familiarize himself with the Mark 8 system.[19]

[redacted] Once the capsule was sighted, the RAC designated as the primary recovery pilot conducted a fly-by to inspect the

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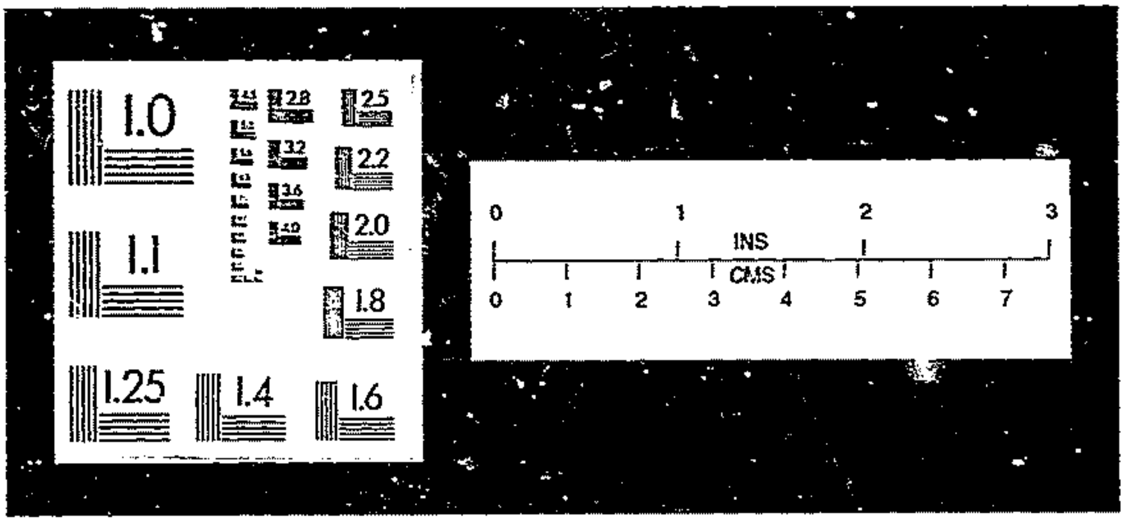

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capsule and insure the parachute and cone had deployed properly. With the descending system in view and stabilized, the C-130 was slowed, and at about 20,000 feet the aircraft was depressurized. The rear ramp was opened and the aerial recovery set was extended. The riggers extended and lowered the poles into their recovery configuration. Once the aerial recovery set was rigged and ready, the RAC maneuvered to make a recovery pass on the system at about 15,000 feet. He flew directly toward the recovery system, allowing the aircraft to lose altitude, matching the parachute's descent. Passing slightly over the cone, the JC-130's recovery hooks would engage one of the loadbearing lines of the parachute. The computer-controlled winch played out the cable to maintain a preset tension while bring the system up to aircraft speed. When the system was in tow and stabilized, the winch operator reeled it aboard. After the capsule was safely aboard the aircraft, the recovery rig was retracted, the aircraft repressurized and it returned to Hickam.[20]

[redacted] The surface recovery forces were the last to launch. They consisted of HH-53C helicopters and a primary C-130P tanker. The tanker provided aerial refueling and escort for the helicopters on their way to and from their on-station position. The last aircraft to launch was the secondary tanker which would climb to altitude, maintain its best cruise for fuel conservation, and remain available in the event the primary

[redacted]

tanker had a mechanical problem or ran low on fuel and had to return to Hickam before the mission was complete. The secondary tanker also escorted the helicopters home after the mission. The HH-53C helicopters began surface recovery operations by completing a mid-air refueling to obtain a required load of fuel. Each aircrew member then completed a specific pre-recovery checklist: The pilots checked engine power and systems for a long, over-water hover; the flight mechanics checked the rescue hoist and surface recovery system; and the pararescue specialists donned their wetsuits, tanks and other mission equipment. Once the system was located in the water, its position was marked with smoke flares. The flares helped assure visual contact with the system and also provided a visual wind indicator for the helicopter pilots as they flew in for pararescue specialist deployment. At about ten feet and ten knots, each of the helicopters deployed a pararescue team -- two helicopters, one team on each -- a total of four men in the water. The surface recovery system operator moved the set the the aft ramp once the helicopter was in a hover. In the water, each pararescue team had a specific task. The team from the first aircraft was responsible for preparing the capsule for pickup while the other team was responsible for preparing the mission parachute. Once the capsule and parachutes were ready, the pararescue crews signaled the helicopters. The pilot of the first HH-53C achieved a hover directly over the capsule and the

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pararescue team would engage the hook of the surface recovery set. After making the hookup, the pararescue team swam forward to the rescue hoist and were hoisted aboard the helicopter. Once the PJs were safely aboard, the recovery system operator began hoisting the capsule out of the water. The process was then repeated for the parachute. Once the capsule and parachute were secured aboard the helicopters, the recovery force returned to Hickam.[21]

[redacted] If the Group's helicopters could not support a mission, the Navy provided a backup surface recovery capability. Once the recovery system was located, four pararescue men would jump from a JC-130 and prepare the capsule and parachute. The Navy ship -- normally a salvage vessle, however, destroyers were also used -- would steam to the capsule, sometimes taking two or three hours to arrive. The pararescue team place a flotation collar around the capsule and enter life rafts until the ship arrived. (As part of a security system, the recovery capsules had errodable plugs which would disintegrate after a period of time in the water, causing the capsule to sink.) Once the ship arrived in position, it would use a crane to hoist the capsule aboard and stowed in a specially designed cradle. Also on board the ship was a Test Group officer, usually a helicopter pilot, who ensured the proper procedures were followed during handling of the capsule.[22]

[redacted]

[redacted]

Secondary Missions [redacted]

[redacted] The Test Group possessed a unique combination of highly trained aircrews, specialized equipment and mission support staff. Frequently, the Group was asked to apply these assets to support other organizations and activities. As a result, in addition to their primary responsibility of recovering deorbited capsules from Department of Defense spacecraft, the men and women of the Test Group supported a number of other recovery operations.* Occasionally, these taskings were relatively simple -- such as providing transportation for visiting dignitaries; flying HH-53C and HC-130P missions supporting Military Airlift Command's Cobra Judy radar identification tests; helping ferry Navy TA-4 aircraft; demonstrating aerial refueling techniques with Army CH-47 helicopters; and demonstrating aerial recovery techniques to a team from the National Aeronautics and Space Administration's Wallops Flight Facility. (The Wallops facility recovered research payloads weighing between 5 and 350 pounds and wanted to view the Test Group's work with heavier payloads.) Other "secondary" missions required extensive planning and preparation. At the time of the Group's deactivation, the 6594th crews were supporting a number of secondary missions including the Air Force Geophysics Laboratory's Stabilized High Altitude Research Platform; the U.S. Army's Designating Optical Tracker which was launched from

[redacted]

the Kwajalein missile range to intercept an inbound ICBM launched from Vandenberg AFB; and flew sea and land surveillance missions supporting law enforcement agencies.** 23

[redacted] Furthermore, since they possessed a unique aerial recovery capability, the Test Group crews were required to develop and test their recovery equipment and they continually refined their recovery techniques. Originally, this was performed by Detachment 1 of the Air Force Satellite Control Facility, located at Edwards AFB, California. Later, this function was incorporated into the Group's Test Engineering Branch at Hickam AFB. Additionally, members of the Group frequently spend numerous hours testing and evaluating alternate recovery equipment and techniques including the heads-up display (HUD), various parachute configurations and alternative surface recovery techniques.[24]

Biosatellite [redacted]

[redacted] One of the first "secondary" missions supported the National Aeronautics and Space Administartion's Biosatellite project. In the early sixties, scientists did not know what affects space travel would have on living organisms -- and this needed to be clearly determined before sending men into space. Biosatellite was the pioneering effort to conduct biological scientific experiments in space. A series of orbital flights

were designed to determine the effect of weightlessness, and in some instances combined weightlessness and controlled radiation, on a variety of biological specimans. They started with relatively primitive life forms such as amoeba, pepper plants, frog eggs, mold, bacteria, beetles, seedings, plants and fruit flies and culminated with a primate.[25]

[redacted] The Test Group's role in the Biosat program was to recover the capsules. Although by this time, the recovery procedures were relatively well-defined, working with NASA did present some additional challenges -- as the Air Force Satellite Control Facility would again discover when working with the Space Transportation System. The most obvious disparity was in the dissemination of information. Bob Lindsy of the San Jose Mercury News reported, "Space officials face a sticky problem in decidinlg how to deal with the public over an upcoming space flight that combines science and secrecy. . . . [Test Group] exploits were well publicized until March, 1961, when Secretary of Defense Robert McNamara personally ordered all publicity to cease about the unit and its parent operation at Sunnyvale.... By NASA's Congressional charter, the Space Agency must conduct all operations in full view of the world." NASA resolved the 'delema' by publishing a security classificattion guide which restricted release of specific recovery information such as the primary force composition and deployment, communications, coded events summary and the actual recovery sequence.[26]

[redacted]

[redacted] The first BioSat mission was launched from the Eastern Test Range on 14 December 1966 and flew a three-day mission; however, it failed to deorbit and reenter as planned. After more than two months of unsuccessful search by both United States and Austrailian forces, the capsule was considered lost. Nevertheless, there was significant outcry from the Australian press about the dangers of irradated insects landing in their country.[27]

[redacted] Recovery of Biosat II was as planned at 6° 55' N and 162° 10' W, an estimated 15 miles from the predicted impact point. The aircraft interior was maintained at 16° C on the flight to the laboratory at Hickam AFB and disassembly was begun in the air-conditioned trailer laboratory at Hickam AFB 3 1/2 hours after retrival.[28]

[redacted] The final flight was launched from Patrick AFB on 29 June 1969. This was a primate mission and was scheduled for 30 days; however, telemetry indicated that "Bonnie" refused to consume water after 2100Z on 6 July 1969 and experienced a lowered body temperature, reduced heart-beat rate, shallow breathing and substantial periods of sleep. NASA decided to call down the spacecraft for reentry the following day. The capsule overshot the predicted impact point, however, the recovery aircraft acquired the capsule's beacon. Subsequent readings confirmed the capsule had overshot the predicted impact point -- by 173 miles. Shortly thereafter, visual sightings

[redacted]

were reported and air-recovery procedures began; however, the first aircraft on the scene broke a hook retainer which prevented deployment of the aerial recovery set. A second aircraft arrived and began a 15-second recovery pattern, but the capsule descended into clouds at approximately 6,000 feet -- 10 seconds before contact could be made. The low cloud base (1,000 feet) and poor visibility (less than 1 mile) precluded further attempts at aerial recovery. Splash was observed at 2241GMT and the impact point was marked by smoke and sea dye immediately. Intermittent rain showers prevented attachment of a balloon station for water-to-air retreival; and a CH-3B helicopter recovered the capsule from the water at 2344Z. They flew directly to Hickam and returned the capsule to NASA scientists at 0041 GMT.[29]

Ash Can [redacted]

[redacted] The department of Energy and the Air Force Geophysics Laboratory were tasked to collect whole air and particulate debris samples from the atmosphere. Their project, Ash Can, used balloons to float experimental packages and scientific sampling equipment at predetermined altitudes in the airspace over Alaska, Panama and the Southwest United States.* Once sampling was completed, a radio command separted the experimental package from the balloon and destroyed

the balloon. The payload descended on parachute for aerial recovery. The Test Group began supporting Ash Can missions with a deployment to Alaska on 15 May 1964. They subsequently supported missions from Panama and Brazil. In January 1967, the Test Group suspended Ash Can support as the Aerospace Rescue and Recovery Service assumed that responsibility. However, in 1979, the Group resumed Ash Can support -- the result of a Military Airlift Command initiative "to reduce the inefficiencies of two commands performing similar missions". The Test Group resumed Ash Can support with nominal results.[30]

Rescue Activities [redacted]

[redacted] Although it was not part of their official mission, the men and women of the Test Group frequently participated in a variety of rescue missions. Test Group crews felt so strongly about this, that many (particularly the pararescue specialists) voluntarily practiced and refined their life-saving skills on their own time. Nevertheless, sometimes superb training and preparation were not enough. Thus it was on 15 January 1985, during a rescue mission, one of the Test Group's HH-53C helicopters crashed, killing seven crew members aboard the flight, designated Arris 01.* Killed were: Captains David O. Mason and Stephen Pindzola; Second Lieutenant Russell H. Ohl; Staff Sergeants John R. Gilbert, Kyle D. Marshall and Daniel R.

Reihman; and Sergeant Robert A. Jermyn. Undersecretary of the Air Force Edward C. Aldridge Jr expressed his personal sorrow and added, "The Air Force is truly proud of these crewmembers and the sacrifices that have made for their fellow-men. They are true heroes."[31]

[redacted] The vast majority of rescue support in the Hawaii area was provided by the Coast Guard and Navy. However, the Test Group had several unique resources. The pararescuemen (PJs) were trained medics, scuba divers and parachute jumpers and could provide medical aid under circumstances which would normally have been impossible. Furthermore, the HH-53C helicopters and their associated aerial refueling support allowed the Group to support operations more than 500 miles from land -- the other services were limited to less than 100 miles and they had no PJs. The Test Group supported search and rescue operations as well as medical evacuation (medevac) on a non-interference basis with its primary mission. Resources were committed only in bona fide life-threatening emergencies as confirmed by a qualified medical personnel and the Honolulu Joint Rescue Coordination Center.[32]

[redacted]

* [redacted] During its history, the Group went through a number of name and organizational changes. For purposes of clarity in this chapter, references to the Group or Test Group or 6594th, etc automatically include the 6593rd Test Squadron and Recovery Control Group, as appropriate.

** [redacted] Originally, C-119s were used for aerial recovery and there was no organic surface recovery capability. Eventually, the Group received CH-3 and later the HH-53 helicopters. See also Chapter III.

1. Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

2. Pub [redacted], T.O. 1C-130(J)B-1, Partial Flight Manual, JC-130B, JC-130H and HC-130B, 4 Oct 84.

* [redacted] The winch had a breaking mechanism which allowed the capsule to accellerate slowly to match the recovery aircraft's speed. Early versions of the recovery system looped the recovery cable in a trough with cords attached. The cords were designed to break, absorbing the impact forces.

3. Pub [redacted] T.O. 13D-1-2-2-2, Aerial Recovery Equipment Subsystem P/O, Space Vehicle Aerial Recovery Set, Type A/A37U-14, 15 Jun 68; Pub (U), Aerial Retrival System, 6594TG, Feb 80; Pub (U), T.O. 1C-130(J)B-1, Partial Flight Manual, JC-130B, JC-130H and HC-130B, 4 Oct 84; and Pub (U), 6594TGP 51-3, Aerial Recovery Specialist (Rigger) Lesson Plan Guide, 6594TG, 1 Dec 84.

4. Pub [redacted], T.O. 1C-130(J)B-1, Partial Flight Manual, JC-130B, JC-130H and HC-130B, 4 Oct 84.

5. Pub [redacted], HH-53C Helicopter Maintenance Officer Course, 6594TG/LG, c. Feb 85; and Pub (U), T.O. 1H-53(H)B-1, Flight Manual, HH-53B, HH-53C and CH-53C Helicopters.

6. Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations (U), 1 Sep 84.

7. Pub [redacted], SRO OI 11-1, Mission Coordinator/Day Duty Officer's Responsibilities, 6594TG/SR, 31 Jul 84; and Pub (FOUO), Operating Instructions for the USAF Recovery Control Center, 6594TG, 1 Jan 73.

8. Pub [redacted], Operating Instructions for the USAF Recovery Control Center, 6594TG, 1 Jan 73.

[redacted]

[redacted]

9. Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

10. Pub [redacted], SRO OI 11-1, Mission Coordinator/Day Duty Officer's Responsibilities, 6594TG/SR, 31 Jul 84.

* [redacted] The training recovery films were particularly important for the recovery aircraft commanders -- RACs-- since the aerial recovery was strictly a visual maneuver. The training films were used extensively by the RACs to detect and correct any ineffective techniques. Poor performance during a training mission would cause a RAC to be removed from the recovery lineup.

11. Brfg [redacted], 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85.

12. Brfg [redacted], 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85.

13. Pub [redacted], SRO OI 11-1, Mission Coordinator/Day Duty Officer's Responsibilities, 6594TG/SR, 31 Jul 84; and Brfg (S-OADR), 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85.

14. Brfg [redacted], 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85.

15. Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations (U), 1 Sep 84.

16. Brfg [redacted], 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85; and Pub (S-OADR), 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

17. Brfg [redacted]), 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85; and Pub (S-OADR), 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

18. Brfg [redacted], 6594th Test Group Mission Briefing [redacted], Maj J.R. Stoneberger, AFSCF/RY, Feb 85; and Pub (S-OADR), 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

19. Pub [redacted], 6594TGR 55-1, Vol I, Flying Operations, 15 Mar 85.

[redacted]

20. Pub [redacted], Operational Procedures for Special Programs, 6594TG, c. Mar 76; and Pub [redacted], 6594TGR 55-1, Vol I, Flying Operations, 15 Mar 85.

21. Pub [redacted], T.O. 1H-53(H)B-1, Flight Manual, HH-53B, HH-53C and CH-53C Helicopters; Pub [redacted], 6594TG Supp 1 to AFSCM 55-1, Vol XI, Helicopter Aircrew Training, 15 Jul 85; Pub [redacted], 6594TGR 55-1, Vol I, Flying Operations, 15 Mar 85; and Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

22. Pub [redacted], SRO OI 11-1, Mission Coordinator/Day Duty Officer's Responsibilities, 6594TG/SR, 31 Jul 84; Pub [redacted], 6594TGR 55-1, Vol I, Flying Operations, 15 Mar 85; and Pub [redacted], 6594TG OPLAN 1-84, Recovery Operations [redacted], 1 Sep 84.

* [redacted] The following discussion is not an exhaustive review of these missions; rather it is designed as a representative review. Some of the "secondary" programs are not addressed due to security limitations; others are not included simply because of the scope of this project and the resultant limits of time. Nevertheless each of the programs was important and deserves thorough coverage at some future time.

** [redacted] A general description of these operations is contained in the periodic AFSCF histories.

23. Hist [redacted], Air Force Satellite Control Facility, Oct 83 - Dec 85, pp 163-167. Material used: [redacted]

24. Hist [redacted], Air Force Satellite Control Facility, Oct 83 - Dec 85, pp 163-167. Material used: [redacted]

25. Pub [redacted], Biosatellite project Historical Summary Report, NASA Ames Research Center, Dec 69.

26. TOO [redacted], Biosatellite Program, AFSCF, 21 Mar 69; Art [redacted], "Science, Secrecy in Conflict for Biosatellite Mission," <u>San Jose Mercury News</u>, 18 Sep 66; and SCG (FOUO), Project Biosatellite, NASA Ames Research Center, 20 Mar 67.

27. Rpt [redacted], Operation Lost Ball (NASA Biosatellite I) Final Report, AFSCF, 3 May 67.

28. Pub [redacted], Biosatellite project Historical Summary Report, NASA Ames Research Center, Dec 69.

[redacted]

29. Ltr [redacted], Col C.E. Hughes, AFSCF/SMOTV, to AFSCF/SMO, "SCF Operations Evaluation Report [redacted]," 13 Aug 69; and Pub [redacted], Biosatellite project Historical Summary Report, NASA Ames Research Center, Dec 69.

* [redacted] The program received the name from the shape of the clynderical recoverable systems which looked like an ash can.

30. Hist [redacted], 6593 Test Squadron, Jan-Jun 64, p 6; Hist [redacted]), 6593 Test Squadron, Jan-Jun 67, p 2; Hist [redacted]), 6594 Test Group, Jan-Jun 67, p 9; ARRS OPPLAN 9511 ([redacted]), Ashcan, 15 Jul 76; Ltr [redacted], MGen R.F. Cloverdale, MAC/XPPP(X), to Hq USAF/PAX, et al., "Transfer of the HC-130 Air-to-Air Recovery (ATAR) Mission," 13 Mar 79; and Ltr [redacted], Maj R.E. Cherry, 6594TG/DO, to 6594TG/LG, et al., "ASHCAN Project Trip Report," 26 Mar 80.

Ed Note: Tim, I'd liked to have included the numbers on Ash Can, but they were widely scattered and rather than giving an inaccurate figure, I avoided the issue.

* [redacted] Details of the accident are contained in Rpt [redacted], Class A Flight Mishap, HH-53C, SN 68-10355, 15 Jan 85, filed CSTC/HO.

31. Hist [redacted], Air Force Satellite Control Facility, Oct 83 - Dec 85, pp 166-167. Material used: [redacted]

32. Pub [redacted], Operating Instructions for the USAF Recovery Control Center, 6594TG, 1 Jan 73; Pub [redacted], SRO OI 11-1, Mission Coordinator/Day Duty Officer's Responsibilities, 6594TG/SR, 31 Jul 84; Pub [redacted], 6594TG Supp 1 to AFSCM 55-1, Vol XI, Helicopter Aircrew Training, 15 Jul 85; and Pub [redacted], 6594TGR 55-1, Vol I, Flying Operations, 15 Mar 85.

[redacted]